REGULATION III - CONTROL OF AIR CONTAMINANTS

RULE 347
FERROUS SAND CASTING

INDEX

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MARICOPA COUNTY
AIR POLLUTION CONTROL REGULATIONS

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RULE 347
FERROUS SAND CASTING

SECTION 100 - GENERAL

101 PURPOSE: This rule is to limit the amount of volatile organic compounds (VOCs) emitted by organic binder materials and other organic materials used in molds made of sand or other finely divided refractory material, in which ferrous metals are cast.

102 APPLICABILITY: This rule applies to the sand-casting of ferrous metal and does not apply to investment casting.

SECTION 200 - DEFINITIONS: For the purpose of this rule, the following definitions shall apply:

201 BINDER - Any material which is used to bind molding sand or other refractory particles into a cohesive mold or part of a mold used for metal casting. The term, binder, includes any catalysts and any additives incorporated or mixed into the binding material, unless such catalyst or additive is excluded in writing by the Control Officer.

202 CERTIFIED PRODUCT DATA SHEET - A document, signed by an officer of a binder or coating-supplying operation, that states the maximum organic content or VOC content of a particular product as supplied.

203 DAY - A period of 24 consecutive hours beginning at midnight.

204 EMISSION CONTROL DEVICE - A system, approved in writing by the Control Officer, which reduces emissions of organic compounds and consists of collection and control devices which are designed and operated in accordance with good engineering practice.

205 EXEMPT COMPOUNDS - The non-VOC, evaporating portion of a formulation; this necessarily includes all non-precursor organic compounds and all volatile inorganic compounds such as water.

206 FACILITY-SPECIFIED WORKDAY - The regular starting time (and ending time) chosen by a facility operator to designate the facility's own workday of 24 consecutive hours.

207 FERROUS METAL - Iron, steel, or a metal alloy in which iron is the greatest constituent.

208 INVESTMENT CASTING - A type of metal casting otherwise know as “lost-wax process” in which a mold, later used to receive molten metal, is built up around a fusible model. When the mold attains sufficient size, the model is melted out of the mold.

209 MOLD-WASH - A liquid coating or surfacing agent, containing refractory particles and binding agent(s), which is applied to the heat-receiving surfaces of a mold to impart desired casting properties.

210 NON-PRECURSOR ORGANIC COMPOUND - Any of the organic compounds which have been designated by the EPA as having negligible photochemical reactivity and that are set forth in the definition of non-precursor organic compound in Rule 100.

211 ORGANIC BINDER MATERIAL - The organic-compound portion of those binders that contain more than 5% organic compound(s) by weight.

212 ORGANIC COMPOUND - Any compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate.

213 SAND - Granular, non-flammable, mineral material which lacks an organic component and has refractory properties.

214 SAND CASTING - A type of metal casting in which molten metal is poured into a mold made primarily of sand or other finely divided refractory material, bound together by binder material. For the purposes of this rule, sand casting does not include investment casting.

215 VOC CONTENT (POUNDS OF VOC PER GALLON OF MATERIAL) - The weight of VOC per volume of material that can be calculated by:

$$\text{Pounds of VOC per Gallon of Material} = \frac{W_s - W_{es}}{V_m}$$

Where:

W_s = weight of all volatile (evaporating) material, in pounds

W_{es} = weight of water and all other exempt components, in pounds

V_m = volume of material, in gallons.

216 VOLATILE ORGANIC COMPOUND (VOC) - Any organic compound which participates in atmospheric photochemical reactions, except non-precursor organic compounds.

SECTION 300 - STANDARDS

301 LIMITS: No person shall operate a ferrous sand-casting facility with an aggregate emission to atmosphere of 150 pounds (68 kg) or more of VOC in any day or 25 tons (22.7 Mg) or more of VOC in any year from ferrous sand-casting operations, unless VOC emissions from mold binders are controlled either pursuant to subsection 301.1 or pursuant to subsection 301.2.

301.1 Control Device: (An) Emission Control System(s) which through capture and control reduces the total, facility-wide VOC emissions from binder by at least 81% as determined by the test methods referred to in Section 503 of this rule. VOC emissions from binders shall include but not be limited to VOC emitted from binders during mold-making, metal casting, and offgassing from residual binder adhering to granules of mold sand.

a. Such System shall be operated whenever VOC emissions from binder can exceed 7 pounds (3.2 kg) per day, facility-wide.

b. The requirement for 81% control in subsection 301.1 does not apply to those clock hours during which the operator can demonstrate that such mold-binder VOC-emissions are less than 1 pound per hour, facility-wide.

301.2 Alternative Compliance Method: For each facility-specified workday in which molds are made, the ratio of organic binder-material in all binder used to all sand receiving binder shall not exceed 1.35 to 100, by weight, as determined by the formula in subsection 503.6 of this rule.

a. The organic material in binders that contain no more than 5% organic compound(s) by weight is excluded from inclusion in the formula.

b. Failure to obtain the sand ordinarily used for molding shall not be an excuse to exceed the binder-to-sand ratio limit pursuant to subsection 301.2, except as is provided in Rule 100, Section 501 of these rules.

301.3 Surfacing Materials: A person shall comply with the following limits when using mold-wash or other mold surfacer:

a. VOC content:

(1) Prior to 12:01 AM, January 1, 1999, neither mold wash nor other mold surfacing product shall contain more than 2.5 lb VOC/gal (300 g/l).

(2) After 12:01 AM, January 1, 1999, neither mold wash nor other mold surfacing product shall contain more than 1.0 lb VOC/gal (120 g/l).

b. Averaging option: In lieu of observing the mold-wash VOC limit in subsection 301.3a, a person may choose to average mold-wash VOC content over each completed facility-specified workday, pursuant to all provisions in (1) and (2) as follows:

(1) For each facility-specified workday, the average is recorded within 13 hours after the start of the following facility-specified workday, using the formula in subsection 503.7 of this rule; and

(2) Such average does not exceed a VOC content of 0.90 pounds VOC per gallon.

301.4 Gassing Operations: If a binder system that includes the injection of a reactive gas, can without controls emit more than 1 pound per hour of VOCs, its emissions shall be controlled by an emission control device that attains one of the following levels of control.

a. 85% overall control (capture and processing) of such VOC.

b. 90% capture and a maximum of 3.5 pounds per hour VOC emission from the control device at any and all production levels.

302 OPERATION AND MAINTENANCE:

302.1 General Maintenance: Any person subject to this rule shall operate and maintain in proper working order all process equipment in which VOC-containing materials are used or stored.

302.2 A Systematic Program To Establish Compliance With Subsection 301.2: The owner/operator, complying with this rule pursuant to subsection 301.2 of this rule, shall have a systematic program as follows:

a. The program shall consist of devices and/or other effective means, which each day accurately indicates the amount of sand and the amount of binder, catalyst and any other additive that contains organic compound(s) and is incorporated into the molding sand.

b. Such program shall be in effect continuously during the mixing of binder with molding sand, and shall be of sufficient accuracy and consistency as to determine compliance with subsection 301.2 of this rule.

c. Any devices that are part of the program and are resettable shall be so protected as to preclude resetting by personnel not designated by the operator.

d. The systematic program shall include a complete, written description of its correct functioning, and shall be subject to the Control Officer's approval.

302.3 Operation and Maintenance (O&M) Plan Required for ECS:

a. The owner or operator of an emission control system (ECS) operated pursuant to subsection 301.1 or subsection 301.4 of this rule shall have an Operation and Maintenance (O&M) Plan for each ECS. This O&M Plan shall specify key system operating parameters, such as temperatures, pressures and/or flow rates, necessary to determine

compliance with this rule, and describe in detail procedures and their frequency of implementation needed to maintain the ECS. The owner or operator shall provide a copy of the O&M Plan, if so requested by the Control Officer.

b. The owner or operator shall implement all provisions of the O&M Plan with the frequency specified by the Plan.

c. Changes in frequency: Changes involving reduction in the frequency or extent of procedures or parameters in a Control-Officer approved O&M Plan shall have the written consent of the Control Officer prior to being implemented.

d. Other changes: An updated O&M Plan must be submitted to the Control Officer for review within 10 days of any changes not involving reduction in frequency or extent of procedures or parameters of an approved O&M Plan. Within five working days of a written disapproval of such changes, either the original O&M Plan shall be reinstituted or an alternative plan, negotiated with the affected facility and approved in writing by the Control Officer, shall be instituted.

303 STORAGE AND DISPOSAL OF BINDERS, SOLVENTS, AND OTHER VOC-CONTAINING MATERIAL:

303.1 Storage: A person shall cover and keep covered or enclosed each uncured binder material, any solvents, and any other VOC-containing material which are not in use. A person shall store binder materials and cleaning materials in closed or covered containers.

303.2 Disposal Of VOC And VOC-Containing Material: A person shall store all waste materials containing any VOC in fluid form, including but not limited to uncured binder components, rags, waste coatings, waste solvents and their residues, in closed containers. Such containers shall have labels that legibly identify their contents and shall remain covered except when contents are being added or removed.

304 EXEMPTIONS: Each calendar year an owner or operator is allowed to claim a total of 55 gallons of mold-wash that is exempt from all requirements pursuant to subsection 301.3 of this rule if all such mold-wash is separately identified, logged, and each month is cumulatively totaled for the year.

SECTION 400 - ADMINISTRATIVE REQUIREMENTS

401 COMPLIANCE SCHEDULE: This rule is effective September 1, 1998.

402 OTHER REGULATORY MATTERS:

402.1 Nothing in this rule shall relieve a person from complying with other applicable environmental statutes and rules.

402.2 Rule 331 of these rules applies to cleaning, degreasing, and stripping processes which can emit VOC. Rule 336 applies to the coating of castings.

SECTION 500 - MONITORING AND RECORDS

501 RECORDKEEPING AND REPORTING: An owner or operator subject to this rule shall keep the following records and lists in a consistent and complete manner, and shall make them available to the Control Officer upon request. Records of the previous 12 months, requested during normal business hours, shall be made available without delay. Each of the following records shall be maintained for a minimum of five years:

501.1 Current List:

a. Maintain a current list of all VOC-containing fluid materials as received by the facility such as binders and/or binder components, coatings, cleaning solvents, lubricants and any other VOC-containing substances.

b. List the name or designation of each and include next to it the VOC content of each in pounds per gallon or grams per liter.

c This requirement does not apply to materials having less than 2 percent organic content by volume as received.

501.2 Monthly Schedule: By the end of the following month, an owner or operator shall update the following records for each completed month:

a. The amount of each binder constituent used.

b. The amount of each mold-wash and surfacer used.

c. The quantity and type of VOC-containing solvent added each month as a diluent in binders, mold-wash, surfacer, or as a diluent in some other production capacity.

d. The quantity of fluid VOC or material containing any fluid VOC disposed of offsite. This includes VOC on rags, sand, and other materials.

e. Annual Exception: Yearly, update the totals of the usage of each fluid, VOC-containing material that is known to be used in amounts totaling less than 15 gallons (57 liters) per year for all that type of material.

501.3 Frequency Of Computing The Binder-To-Sand Ratio: The following provisions apply to a facility complying with VOC limits pursuant to subsection 301.2 of this rule:

a. Monthly: Computations of mass balance for the month shall be made according to the period-weighted average formula in subsection 503.6 of this rule within 7 workdays after the end of the month.

b. Daily From Meter Readings: Such calculations for each day, determined with the numerical output(s) of the system run pursuant to subsection 302.2 of this rule shall be completed and entered in a log by 12:01 PM of the following workday or by the middle of the first shift of the following facility-specific workday.

c. Reduced Frequency of Determination for Ratios Below Limits:

(1) Earning weekly determinations: If no daily ratios exceed 1.27 : 100 for forty consecutive workdays and no weekly ratio is above 1.25 : 100 during the same period, then weekly averaging may be instituted in place of daily calculations of the daily average, until such time as that weekly ratio is exceeded. Following such an exceedance, daily determinations shall be resumed.

(2) If there is no weekly average ratio above 1.20 : 100 for 10 consecutive weeks, then the following schedule may be followed:

(A) Determine each month's average by the middle of the first full, facility-specified workday of the following month; and

(B) In each month, determine the weekly average-ratio of a single, selected week in that month by the middle of the first full workday of the following week. The selected week shall be either the week specified in **(i)** or shall be the week specified by the Control Officer pursuant to **(ii)**:

(i) Determine the weekly average ratio for the week that falls immediately after the 3rd full work-week of the month.

(ii) The Control Officer may from time to time designate to the operator a random work-week of the month for determination of that week's average organic-compound to sand ratio. The Control Officer shall notify the operator prior to the commencement of production activities for the designated work-week.

(C) Determine the weekly average ratio by the middle of the first full workday of the following week. If any monthly average ratio exceeds 1.19 :100 or if any weekly average exceeds 1.20 : 100, then weekly averaging shall be resumed, unless the daily ratio maximum in 501.3c(1) of this rule is also exceeded, in which case daily determinations shall be resumed pursuant to subsection 501.3b.

(3) The schedule of determinations pursuant to subsections 501.3c(1) and (2) is disallowed if any exceedance or violation occurs of said schedule or of subsection 301.2 requirements. In either case, the operator shall then resume each schedule in subsections 501.3a and 501.3b.

(4) Reinstatement: Should an operator desire to reinstate a schedule provided in subsection 501.3c, the operator shall make

such a request, in writing, to the Control Officer. The request shall state changes or improvements that make meeting the schedule's requirements reasonably certain. The Control Officer shall approve or deny such a request in writing.

502 INSTALLING AND MAINTAINING ECS MONITORING DEVICES: Any person operating an Emission Control System (ECS) pursuant to subsection 301.1 of this rule shall install, maintain, and calibrate monitoring devices described in an O&M Plan submitted to the Control Officer pursuant to subsection 302.3. The monitoring devices shall measure temperatures, pressures, rates of flow, or other operating conditions necessary to determine if air pollution control equipment is functioning properly.

502.1 ECS Operation and Maintenance Records: On each day that an ECS is used to comply with Section 301 of this rule, an owner or operator shall make a record, retained for 5 years, of the operating parameters of the key systems described in the O&M Plan. For each day or period in which the O&M Plan requires that maintenance be performed, a permanent record shall be made of the maintenance actions taken, within 24 hours of maintenance completion. An explanation shall be entered for scheduled maintenance that is not performed during the period designated in the O&M Plan.

502.2 Other Records Required When Complying Via ECS: An owner or operator choosing to meet the requirements of Section 301 through the use of an ECS shall maintain, in addition to the monthly records required by subsection 501.2 of this rule, daily records showing the amount of binder, wash, and diluent used.

503 COMPLIANCE DETERMINATION - TEST METHODS: When more than one test method is permitted for a determination, an exceedance of the limits established in this rule determined by any of the applicable test methods constitutes a violation of this rule.

503.1 Calibration of Metering Equipment on the Sand/Resin Mixer:

a. Each month or as often as calibration is prescribed by the operating instructions supplied by the manufacturer , whichever is more frequent, the amount of sand delivered per minute at each different sand-supply rate for each different sand-supply equipment-configuration in current use shall be determined prior to any adjustment, and recorded. The same shall be done for the binder at each resin ratio setting and for the catalyst flowmeter if one is used pursuant to required calculations.

b. If adjustment is made to any device of which such adjustment can affect the flow rate, a flow rate test shall be performed subsequent to completion of adjustment, and the result recorded.

503.2 VOC and Organic Content – Laboratory Methods:

a. Washes: The VOC content of mold-washes and surfacers, as applied, shall be determined by a certified product data sheet or EPA Test Method 24 of 40 CFR Part 60, Appendix A. If there is a discrepancy between the information on the certified product data sheet and the results of the Method 24 analysis, compliance status shall be based on the Method 24 results.

b. Binders: The organic-compound content of binders, as used, shall be determined by a certified product data sheet or EPA Test Method 415.1, Total Organic Carbon. If there is a discrepancy between the information on the certified product data sheet and the results of the EPA Test Method 415.1, compliance status shall be based on the Method 415.1 results.

c. Molds: The following are laboratory methods for determining the organic content of sand in a cured mold. Using these methods requires that an initial determination be made of the total organic carbon or the amount of loss on ignition (LOI) of the sand before the sand is combined with binder and formed into a mold.

(1) EPA Test Method 415.1, Total Organic Carbon, or by another Control-Officer approved, standard test-method for determining total carbon that is either an EPA-approved method or is a submethod included by an EPA test-method.

(2) When the percentage of organic compounds in a binder has been established to the satisfaction of the Control Officer, American Foundry Society Procedure 117-87-S, Loss On Ignition, may be used.

503.3 Control efficiency of an emission control device required by Section 301.1 shall be determined according to EPA Reference Method 25 or an applicable submethod of Method 25, 25A, or 25 B (Title 40, CFR Part 60, Appendix A).

503.4 Capture efficiency of an emission control device required by Section 301.1 shall be determined by mass balance in combination with ventilation/draft rate determinations referenced in subsection 503.5, or shall be done in accordance with US EPA Test Methods 204, 204a, 204b, 204c, 204d, 204e, and 204f, Appendix M, 40 CFR 51. This EPA document is incorporated by reference and is available at 1001 North Central Avenue, Phoenix, Arizona, 85004, or by calling (602) 506-6700 for information.

503.5 Ventilation/draft rates of an emission control device required by Section 301.1 shall be determined by EPA Reference Methods 2, 2A, 2C, or 2D (40 CFR Part 60, Appendix A).

503.6 Calculations Determining Compliance With Alternative Compliance Method, Subsection 301.2: Subsection 301.2 requires a determination of the facility-wide, period-weighted average-ratio of the organic mass of all the binders used as compared to the mass of sand receiving the binders during an averaging period. This shall be calculated using the following equation:

Organics to binder-sand ratio =

$$\frac{M_1 O_1 + M_2 O_2 + \ldots\ldots + M_n O_n}{S_{D1} + S_{D2} + \ldots\ldots + S_{DL} + M_1(1 - O_1) + M_2(1 - O_2) + \ldots + M_n(1 - O_n)}$$

O_T (Total Organic Content) = $M_1O_1 + M_2O_2 + \ldots\ldots\ldots + M_nO_n$

where:

O_T Total organic material in the binder system(s) used during the averaging period, in kilograms (or lbs).

O_1 = The organic ratio of the first binder formulation used during the averaging period, expressed in kilograms organic compounds per kg. of binder (lb/lb).

O_2 = The organic ratio of the second binder formulation used during the averaging period, expressed in kilograms organic compounds per kg. of binder (lb/lb).

O_n = The organic ratio of the very last binder formulation used during the averaging period, expressed in kilograms organic compounds per kg. of binder (lb/lb) when a total of "n" formulations were used.

M_1 = The total mass, used throughout the period, of the first binder formulation used that period, expressed in kg. or lb.

M_2 = The total mass used throughout the period, of the second binder formulation used that period, in kg. or lb.

M_n = The total mass, used throughout the period, of the very last binder formulation used that period, when a total of "n" formulations were used, expressed in kg. or lb.

S_{D1} = The mass of sand used in day one of the averaging period.

S_{D2} = The mass of sand used in day two of the averaging period.

S_{DL} = The mass of sand used on the last day of the averaging period.

503.7 Daily-Weighted Average VOC Content of Mold Washes: The daily-weighted average VOC content of all the mold-wash used facility-wide during a facility-specified workday, a quantification required in order to comply with subsection 301.3b, shall be calculated using the following equation and be expressed in grams of VOC per liter of mold-wash (or lbs./gal).

$$VOC_W = \frac{V_1 C_1 + V_2 C_2 + \ldots + V_n C_n + M_{va}}{V_1 + V_2 + \ldots V_n + V_{va} + V_{sa}}$$

where:

VOC_w = The daily-weighted average VOC content of all "n" mold-wash formulations ("a" through "n") used during a workday throughout the facility expressed in grams of VOC per liter of mold-wash (or lb/gal).

C_1 = The VOC content of the first mold-wash formulation used during a workday in grams per liter of mold-wash (lb/gal).

C_2 = The VOC content of the second mold-wash formulation used during a workday, in grams per liter of mold-wash (or lb/gal).

C_n = The VOC content of the very last mold-wash formulation used during a workday when a total of "n" formulations were used, and the only formulation remaining to be accounted for. It is expressed in grams VOC per liter of mold-wash-formulation "n" (or lb/gal).

M_{va} = The total mass of VOC added to any previously formulated mold-wash used during the course of this workday not otherwise accounted for in VOC-content of formulations (expressed in grams or lbs). This includes the VOC portion of added materials which also contain non-VOC components.

V_1 = The total volume used throughout the workday of the first mold-wash formulation used that day, expressed in liters (or gal).

V_2 = The total volume used throughout the workday of the second mold-wash formulation used that day, in liters (or gal).

V_n = The total volume used throughout the workday of the very last mold-wash formulation used that workday, when a total of "n" formulations were used. It is expressed in liters (or gal) of formulation "n".

V_{va} = The total volume of VOC in liters (or gal) added to any and all previously formulated mold-wash during the course of this workday for make-up, viscosity reducing, or other purpose(s), not otherwise accounted for in the VOC-content of formulations.

V_{sa} = The total volume of solids in liters (or gal) added during a workday to any already formulated mold-washes used during the workday such solids are added.